

## SPIDER FAUNA IN THE MANGROVE ECOSYSTEM OF MANDAITIVU ISLAND

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### ABSTRACT

Mandaitivu is an island which is located in Northern Province of Sri Lanka at latitude of 9°36'0" N and longitude of 80°0'0" E. The spider fauna in mangrove ecosystem of this island has not been studied yet due to the civil war in Northern Province of Sri Lanka. The present study was undertaken to record the existence of spider fauna in Mandaitivu Island for the first time. The spiders were collected by sweep netting, hand picking, litter collection and vegetation beating method and were preserved in 70-80% propanol. They were identified on the basis of the colour patterns, eye arrangements, tarsal claws, morphology of epigyne, male palp structure, markings on the abdomen and nature of web. In this rapid survey, a total of 10 morphospecies of spiders belonging to 6 families (Thomisidae, Araneidae, Tetragnathidae, Theridiidae, Lycosidae and Salticidae) were recorded. Among them five species were identified as *Thelacantha brevispina* (Doleschall, 1857), *Tetragnatha maxillosa* (Thorell, 1895), *Argiope anasuja* (Thorell, 1887), *Argiope aemula* (Walckenaer, 1841), *Pardosa birmanica* (Simon, 1884). The highest species composition was recorded from *Avicennia marina* than *Rhizophora mucronata* which has less association of insects than *A. marina* due to the thickness of their leaves. Further detailed survey will be needed to document a more complete picture of the spider fauna of this island.

**Key words:** Araneidae, taxonomy, spiders, mangrove

### INTRODUCTION

Sri Lanka (latitudes 5°54'N and 9°52'N, and longitudes 79°39'E and 81°53'E), together with the Western Ghats of Southern India, is considered as one of the global biodiversity hotspots (Myers et al. 2000). Mandaitivu is an island which is located in Northern Province of Sri Lanka at latitude of 9°36'0" N and longitude of 80°0'0" E. Temperature ranges from 23°C to 25°C. The mangroves which are distributed as patches around this island, supports vast variety of animals by providing food and shelter. However, the species richness and distribution of the arachnids especially spiders has been poorly studied.

In Sri Lanka scientific documentation of spiders was described by Pickard-Cambridge (1869). Then Pocock, (1900) conducted last comprehensive study more than a century ago. Wijesinghe (1987) conducted a preliminary survey on Sri Lankan

spiders comprising of 402 species and a review on the group. During the last decade several arachnologists have done the study on Sri Lankan spiders resulting in the revision of several genera and description of few new species (Benjamin, 2006; Benjamin, 2010; Benjamin and Jaleel, 2010; Kronestedt, 2010; Platnick et al. 2011). Further, these studies also indicated that older nominal species need to be revised and re-described (Benjamin and Hormiga, 2009; Dimitrov et al. 2009; Álvarez-Padilla and Benjamin, 2011). Platnick, (2011) has compiled a catalog of all the spiders recorded to date which stands at, approximately, 42,000 species that belongs to 110 families. To date, 501 species representing 48 families have been listed for Sri Lanka, including 256 (51.09%) endemic species (Platnick, 2011). Further, 11 species that are only identified up to genus level are also found in Sri Lanka which includes an additional family Deinopidae. However the study of Sri Lankan spiders is still in a neonate stage particularly from the Northern part of the country (Nanayakkara and Vishvanath, 2011). Due to the civil war in Northern Province of Sri Lanka, the mangrove habitats including Mandaitivu Island were not accessible for public as well as scientific researchers for more than 25 years. The main purpose of the present study is to document the spider fauna in Mandaitivu Island for the first time.

## MATERIALS AND METHODS

### Study site

The study was conducted in selected mangrove wetland at Mandaitivu Island in the Jaffna district which is located in the Northern Province of Sri Lanka. Study areas were selected with different plant coverage including woody plants and shrubs to facilitate the collection of different varieties of spider fauna.

### Sample collection and preservation

Visual searching method was used for sample collection. Sampling was done twice a month during the morning and evening hours (between 8.00 to 11.30 a.m and 3.00 to 5.30 p.m) from January to August, 2013. On each sampling day different areas were chosen for sample collection. Spiders were mainly collected from the terminals of mangrove plants (*Avicennia marina*, *Rhizophora mucronata* and mangrove associates) and ground stratum by sweep netting, hand picking, litter collection and vegetation beating method. After careful study on the morphology of the spiders under the binocular microscope (Olympus), they were preserved in 70-80% propanol for further analysis in taxonomy.

### Identification of spiders

Spiders were identified based on their colour patterns, eye arrangements, tarsal claws, epigyne, male palp structure, markings on the abdomen, nature of web and classified up to possible taxa group using the available taxonomic keys and guides (Levi, 2002; Miller and Ubick, 2003).

## RESULTS AND DISCUSSION

In this rapid survey, a total of 10 morphospecies of spiders belonging to 6 families (Thomsidae, Araneidae, Tetragnathidae Theridiidae, Lycosidae and Salticidae) were recorded. Among them five species were identified as *Thelacantha brevispina* (Doleschall, 1857), *Tetragnatha maxillosa* (Thorell, 1895), *Argiope anasuja* (Thorell, 1887), *Argiope aemula* (Walckenaer, 1841), *Pardosa birmanica* (Simon, 1884). Other species which are belonging to families Thomsidae (2 species), Theridiidae (1 species), and Salticidae (2 species) are yet to be identified up to species. *Thelacantha brevispina* was the dominant species of each study area.

### ***Thelacantha brevispina* (Doleschall, 1857)**

**Synonyms:** *Plectana brevispina* Doleschall, 1857  
*Gasteracantha mammeata* Thorell, 1859  
*Gasteracantha alba* Vinson, 1863  
*Gasteracantha canningensis* Stoliczka, 1869  
*Gasteracantha suminata* L. Koch, 1871  
*Gasteracantha mastoidea* L. Koch, 1872  
*Gasteracantha observatrix* O. P.-Cambridge, 1879  
*Gasteracantha mammosa* Hasselt, 1882  
*Stanneoclavis latronum* Simon, 1890  
*Gasteracantha mammosa* Dahl, 1914  
*Gasteracantha sola* Saito, 1933  
*Gasteracantha brevispina* Chrysanthus, 1960  
*Thelacantha brevispina* Emerit, 1974  
*Gasteracanthamammosa* Yin et al., 1997  
*Thelacantha brevispina* Tanikawa, 2009

**Distribution-** India, Sri Lanka

**Diagnosis:** According to the book edited by Sebastian, (2009), this species was identified. Total length of female 6-8mm, males 4-6mm. Reddish brown prosoma is covered with grey hairs. It is slightly longer than wide, broad in front. In the cephalic region, there is a median, bulge-like conical elevation; thoracic region abruptly down posteriorly. Ocular quadrangle is wider than long and wider behind than in front. Median eyes subequal in size, posterior medians encircled by black rings. Sternum heart shaped, pointed behind, deep brown in colour with a median reddish patch, clothed with hairs. Labium longer than wide, light brown, distal margin pale. Maxillae light brown with pale outer border, with distinct scopulae. Chelicerae very stout and strong, reddish brown, with moderate boss. Legs reddish brown, short and strong, clothed with hairs; femora III, IV and tibia IV yellowish in colour. Colour pattern of abdomen is greenish brown with white markings including two white eyes centrally, roughly octagonal, wider than long, overlapping strongly on the cephalothorax anteriorly, clothed with pubescence and hairs. The abdomen consists of six spines, two on each side and two at posterior end. Dorsum with a pair of large

yellowish white patches and a few pairs of conspicuous sigilla. Ventrums with a conspicuous tubercle in front of the spinnerets. The female spiders hang by their short legs in the centre of the orb webs.

***Argiope anasuja* Thorell, 1887**

Synonyms: *Argiope anasuja fletcheri* Hirst, 1911

*Argiope plagiata* Karsch, 1891

**Distribution:** India, Bangladesh, Pakistan, Sri Lanka, Maldives

**Diagnosis:** Female: 8-12 mm, Male: 3.5-4.5 mm in size. Cephalothorax is covered with silvery hairs. Cephalic region slightly elevated than thoracic region. Anterior and posterior median eyes are subequal in size, posterior median eye surrounded by black rings, lateral eyes are close to each other in a prominent tubercle, anterior lateral eye is smaller than the posterior lateral, posterior row of eyes are strongly procurved than anterior row as seen from above. Heart shaped sternum. Chelicerae small and weak. Legs are long and clothed with hairs and spines; femora are yellowish dorsally, other segments with indistinct yellow and brown bands. Pentagonal shaped abdomen with yellow and black markings, broadest posteriorly beyond the middle and covered by hairs and pubescence. Females built the orb webs with stabilimentum of two or four silken zig-zag bands radiating from a closed hub.

***Argiope aemula* Walckenaer, 1841**

Synonyms: *Epeira aemula* Walckenaer, 1841

*Epeira striata* Doleschall, 1857

*Argiope trivittata* Karsch, 1891

*Metargiope ornatus lineatus* Marapao, 1985

*Argiope ornata lineata* Brignoli, 1983

*Argiope aemule* Feng, 1990

**Distribution:** India to Philippines, New Hebrides

**Diagnosis:** Female: 25-30mm, Male: 5-8 mm in size. Almost all morphological features and web spinning behaviour are similar to *A. anasuja*, but the abdomen is broadly oval, slightly truncated in front.

***Tetragnatha maxillosa* Thorell, 1895**

Synonyms: *Tetragnatha japonica* Boesenberg and Strand, 1906

*Tetragnatha listeri* Gravely, 1921

*Tetragnatha conformans* Chamberlin, 1924

*Tetragnatha propioides* Schenkel, 1936

*Tetragnatha cliens* Yin, 1976

*Tetragnatha diensens* Zhao, 1993

**Distribution:** South Korea, Australia, Laos, Vietnam, Sri Lanka, China, Myanmar, South Africa, Vanuatu, Japan, Thailand

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Diagnosis: cylindrical body with thin long-legged, measuring 6 to 10 mm in length. Tarsus is three segmented. Eye arrangement in two distinct rows. Abdomen is brownish yellow without any markings. Chelicerae are very longer than the carapace and protruding often armored with numerous teeth in males than females. It often builds orb webs over water.

***Pardosa birmanica* Simon, 1884**

Synonyms: *Lycosa birmanica* Thorell, 1895

*Pardosa bhatnagari* Sadana 1972

Distribution: Sri Lanka and Asian countries

Diagnosis: Dark brown prosoma is longer than wide. Light brown stripe on the centre of the prosoma with a sharp fovea. Black colour ocular region. Heart shaped sternum covered with hairs light brown in colour. Eight eyes are in three rows. There are four small eyes at the bottom row; the eyes of the middle row are larger than eyes on the top row. Labium is dark brown in colour. Legs thin and long covered with spines and hairs with dark brown patches. Oval shaped abdomen pointed at rear end, broadest behind the middle, clothed with some hairs.

**Key to the spiders in Mandaitivu Island**

Spiders belong to the order Araneae of class Arachnida. Spiders can be differentiated by their thin, cylindrical pedicel connecting cephalothorax and abdomen, lack of antennae, mandibles and wings, the hinged fang at the tip of each chelicerae, six-segmented pedipalps, four pairs of walking legs with seven segments, and the finger-like spinnerets at the end of the abdomen.

Primitive spiders are identified by the reduced spinnerets (only four or even as few as two spinnerets), dagger-like fangs nearly parallel in alignment and two pairs of book lungs.....Infraorder Mygalomorphae

Modern spiders are distinguished by having pincer-like fangs that point diagonally and cross each other, most have 6 spinnerets producing extremely sticky silk, and one pair of book lungs plus a pair of air tubes (tracheae).....Infraorder Araneomorphae

1. Eight eyes in two rows, the lateral eyes are adjacent and some distance from the medians; three tarsal claws, trichobothria present in the leg segments except tarsi; six spinnerets sub-equal in size; orb weavers.....2 (Araneidae, Tetragnathidae)

-Not as above; eyes are in different arrangement.....4

2(1) Reddish brown prosoma with grey hairs; six spines on octagonal abdomen is greenish brown with white markings, two white eyes centrally, Ocular quadrangle is wider than long and wider behind than in front. Dorsum with a pair of large yellowish white patches and a few pairs of conspicuous sigilla..... *Thelacantha brevispina*

-abdomen without spines; orb webs with stabilimentum.....3

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3(2) Cephalothorax with silvery hairs; Anterior and posterior median eyes are subequal in size, PME surrounded by black rings, lateral eyes in a prominent tubercle, posterior row of eyes are strongly procurved than anterior row; orb webs with stabilimentum of two or four silken zig-zag bands radiating from a closed hub; Pentagonal shaped abdomen with yellow and black markings.....*Argiope anasuja*

- the abdomen is broadly oval, slightly truncated in front.....*Argiope aemula*

4(1) Large forward facing eyes with excellent eye sight.....5

-Abdomen long, brownish yellow without any markings; tarsus is three segmented; eye arrangement in two rows, black in colour; spinnerets don't form sharp point; legs sparsely spined; large chelicerae and endites extend length of the sternum; the genital plate not sclerotized; build orb webs.....*Tetragnatha maxillosa*

5(4) Eight eyes in three rows; four smaller eyes below large forward facing eyes; long dark brown prosoma; light brown stripe on the centre of the prosoma with a sharp fovea; legs thin, long covered with spines and hairs with dark brown patches .....*Pardosa birmanica*

-Smaller eyes appear laterally; no eyes below large forward-facing eyes; two clawed hunting spiders .....Family Salticidae

The ecosystem itself consists of two major mangrove species such as *A. marina*, *R. mucronata* and mangrove associates (*Clerodendrone inerme*) and beach grass (*Salicornia brachiata*). *A. marina* was the dominant species occupied 90% of the ecosystem with 5% of *R. mucronata*. The highest species composition was recorded from *A. marina* than *R. mucronata* which has less association of insects than *A. marina* due to the thickness of their leaves. In the dense mangrove forest, different varieties of spiders were recorded than sparsely distributed mangrove forest. The fluctuation of prey population (insects), climatic conditions (temperature, humidity) and structure of the vegetation may be the important factors on the diversity of spiders found in a particular habitat. Hawksworth and Kalin-Arroyo, (1995) demonstrated that a correlation exists between the structural complexity of habitats and species diversity. Diversity generally increases when a greater variety of habitat types are present (Ried, Miller 1989). Uetz (1991) suggests that structurally more complex shrubs can support a more diverse spider community.

## CONCLUSION

A rapid survey in one location revealed the existence of 10 different spider species associated with mangrove ecosystem. Therefore more species composition would be exposed if an extensive field survey is performed island wide.

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